FILED VIA ECFS

October 11, 2019

Marlene H. Dortch Secretary
Federal Communications Commission

445 12th Street, SW
Washington, DC 20510

***Re: Notice of Ex Parte Communication,* RM-11847, ET Docket No. 18-21**

Dear Ms. Dortch:

The mmWave Coalition ("mmWC" or "Coalition") submits this response to the *Opposition* of Boeing[1] to mmWC's *Petition for Rulemaking*[2] ("*Petition*"), which requested a modification of Allocation Table[3] Footnote US246 to facilitate innovative commercial uses of bands above 95 GHz, while protecting incumbent passive allocations in those bands. Attachment 1 lists the members of mmWC.

mmWC's Petition is consistent with the policies advocated in Presidential Memorandum on Developing a Sustainable Spectrum Strategy for America's Future, which states:

> Federal agencies must thoughtfully consider whether and how their spectrum-dependent mission needs might be met more efficiently and effectively, including through new technology and ingenuity. The United States Government shall continue to look for additional opportunities to share spectrum among Federal and non-Federal entities.[4]

In that spirit, mmWC proposed a measured, responsible approach that would spur greater innovation in bands above 95 GHz.

New technologies and innovations are increasingly allowing diverse spectrum use cases, including among commercial and Federal users, without causing harmful interference or in any way negatively impacting the important missions of Federal incumbents. It is the goal of

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[1] *Opposition of Boeing to Petition for Rulemaking*, RM-11847, September 13, 2019
[2] *Petition for Rulemaking* of mmWC, RM-11847, August 12, 2019
[3] 47 C.F.R. § 2.106
[4] Presidential Memorandum, October 25, 2018 (https://www.whitehouse.gov/presidential-actions/presidential-memorandum-developing-sustainable-spectrum-strategy-americas-future/)

mmWC to demonstrate that such innovative approaches can be used to permit more intensive use of bands above 95 GHz.

mmWC welcomes a substantive discussion on how to best achieve that goal, but Boeing offers nothing constructive in its *Opposition.* Rather, Boeing makes an unsubstantiated claim of a harmful interference threat to passive EESS satellites, but ignores the *Petition's* numerous proposed protections to avoid such a threat. Boeing also incorrectly claims that the *Petition* is "repetitive." We will address both of these arguments below.

BOEING: "PROPOSED CHANGES US246 TO ALLOW EMISSIONS INTO THE PASSIVE BANDS COULD JEOPARDIZE OTHER CRITICAL INFRASTRUCTURE AND OPERATIONS AND PLAINLY DO NOT WARRANT CONSIDERATION" [5]

mmWC fully agrees with Boeing that it is critical to protect passive EESS satellites from harmful interference. Indeed, the details of the Coalition's proposed changes were drafted with this goal in mind. However, in its *Opposition,* Boeing fails to address the specific text of the proposal to revise US246 and uses only generic arguments to represent the long-standing views of the *status quo*. (For convenience, the mmWC proposed new text for US246 is contained in the Attachment II herein.)

The Coalition's proposal includes several specific details to prevent interference in the proposal that Boeing has never addresses. Instead, Boeing rushes to the conclusion that any change would "jeopardize other critical infrastructure." Since Boeing has no credible evidence that the specific change requested would cause interference to passive satellites, Boeing's position is inconsistent with the policies discussed above for Federal agencies to thoughtfully consider innovative sharing opportunities rather than simply say "no" without a reasoned examination of the proposed use case and conditions that might enable that use case without impeding the agency's core mission.

The specific details in the mmWC's proposed change to US246, summarized below are intended to prevent the very interference concerns Boeing raises in its *Opposition*:

1- The proposed changes do not affect any of the US246 bands below 100 GHz *at all*. However, above 100 GHz the physics of interference risks is very different than at lower bands, allowing greater opportunities for sharing without harmful interference into the relevant Federal bands. At frequencies above 95 GHz, "anomalous propagation," such as ducting or sporadic E propagation,[7] do not exist. Further, the small wavelength permits novel antenna technology, including dynamic antennas, to control the direction of emissions much more tightly than at lower bands and to control emissions in the direction of satellites.

2- mmWC's proposed change clearly states, "all unlicensed devices and all mobile stations are forbidden." We anticipate that tight control of antenna patterns and

[5] Boeing *Opposition* at p. 4
[7] https://en.wikipedia.org/wiki/Sporadic_E_propagation

pointing angles are essential to enable sharing with critical passive systems and such control is not possible in the near term with either unlicensed systems or mobile transmitters.

3- The proposed change also states:

> "FCC and NTIA will only issue licenses or assignments under mutually agreed procedures that assure that authorized Radio Astronomy Service facilities and Earth Exploration Satellite Service stations are protected from both the individual and aggregate emissions to the criteria given in ITU-R RS.2017, ITU-R RS.1858, ITU-R RA.517, ITU-R RA.517, ITU-R RA.611, ITU-R RA.769-2 and ITU-R RA.1031"

This language assures that any FCC license or NTIA frequency assignment in the US246 bands under the proposed change would have to be under "**mutually agreed procedures"** that protected BOTH RAS and EESS passive assignments from "**both the individual and aggregate emissions"** of authorized transmitters to protection levels given in seven different ITU-R recommendations. Such a requirement cannot possibly harm critical infrastructure as suggested by Boeing, since the proposed "mutual agreement" would already assure that such problems would not be an issue.

4- The mmWC proposal provides that if circumstances change due to new technology or operational issues and the US Government seeks an change to *any* of the enumerated ITU-R recommendations, such a change would become binding on both FCC and NTIA as soon as the change was submitted to ITU as a "**formal coordinated FCC/NTIA/DOS US proposal.**" This formality further assures coordination and mutual agreement prior to any codification of rule changes. Such a formality assuages all of Boeing's concerns while providing a pathway for future use of spectrum in a coordinated and cooperative manner.

5- Boeing gives no explanation as to why these enumerated safeguards are inadequate. Boeing also states without additional explanation,

> "However, introducing operational changes that *might* raise the noise floor, such as active service emissions, *could* result in degraded ability or accuracy to forecast.[8] (Emphasis added.)

The Commission should reject Boeing's unsupported assertions, which fail to address any of the protections included in the mmWC's proposal. In contrast, mmWC relied on noncontroversial, widely accepted protection limits that have been developed over years in ITU-R. Yet, Boeing fails to provide any rationale for why these criteria are inappropriate criteria for ongoing protection of passive systems, or why the present absolute ban appropriate above 100 GHz.

The Coalition is open to thoughtful discussion on these or other protection criteria. But our goal is clear: we seek <u>transparent</u> access to blocks of spectrum above 95 GHz under terms that protect the passive allocations but which also allow carefully selected new terrestrial technology on a strict noninterfering basis. Only with such transparency and procedures in place for cooperation, will it be possible to advance the technologic and economic potential of frequencies above 95 GHz in the United States. As we point out in the *Petition*, US246 is not a stagnant document. It has been amended twice in

[8] *Opposition* at p. 5

the past 2 decades when new options were developed to allow interference-free sharing.[9] Progress can only be made with continuing changes as suggested by in mmWC's Petition.

BOEING: "THE COMMISSION SHOULD DISMISS THE PETITION AS REPETITIVE…THE ISSUES IDENTIFIESD IN THE PETITION WERE WHOLLY ADDRESSED BY THE COMMISSION IN THE SPECTRUM HORIZONS ORDER WHEN IT ADOPTED SERVICE RULES AND A NEW EXPERIMENTAL LICENSING REGIME ABOVE 95 GHX."

Boeing appears to (erroneously) believe that the Commission has considered the US246 modification proposal of the Coalition and explicitly rejected it. However, the plain text of the *1stR&O* demonstrates that the Commission declined to address the merits of the Petition at that time. In the *1stR&O*, the Commission found "the mmWave Coalition's suggestion that we take steps to modify US 246, (is) an initiative … beyond the scope of this proceeding."[10] Indeed, the very reason for filing the *Petition* was to ask the Commission to address this issue that it expressly declined to rule on at that time.

If Boeing believes that the framework of the Spectrum Horizons Experimental Service solves the problem of balancing innovation and protecting EESS systems, then the limited experience to date on implementing the new policy shows there are serious questions. For example, on May 20, 2019 Brown University filed the first experimental license application in US246 bands after the adoption of the *1stR&O*.[11] This license application sought a 2 year renewal of experimental license, WI2XVS, which dealt with propagation experiments on the university campus at the following frequencies: 97.5-103, 195-205, 292-308, and 390-410 GHz.[12] The Commission's response to this application is a partial license grant included herein as Attachment III. In Special Condition 4 of this license the Commission at the request of NTIA and NASA rejected the use of two bands: 97.5-103[13] GHz and 200-205 GHz. No substantive reason is given for this denial.

Further adding to concerns that NTIA's and NASA's objection was cursory, Appendix B of the Docket 18-21 *NPRM* contains "list of current and proposed passive satellite operations above 95 GHz was provided by the National Aeronautics and Space Administration." This list contains many satellites and their frequency coverage, but none of these "current and proposed" satellites cover the bands forbidden in the license pursuant to NASA and NTIA objections.[14]

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[9] *Petition* at p. 5

[10] *1stR&O* at fn. 32

[11] Application of Brown University, File No. 0131-EX-CM-2019 (May 20,2019) (https://apps.fcc.gov/oetcf/els/reports/442_Print.cfm?mode=initial&application_seq=92532&license_seq=93511)

[12] These frequencies were chosen because they were available in an off-the-shelf transmitter, Virginia Diodes, Inc. Model AMC 626. Virginia Diodes is a member of the Coalition

[13] No explanation was given by FCC, NTIA or NASA why use of the whole 97.5-103 GHz band was forbidden when the actual band protected by US246 is only 100-102 GHz.

[14] The World Meteorological Organizations OSCAR database of passive satellites also has no present or planned satellites in this band. *See* https://www.wmo-sat.info/oscar/satellitefrequencies

The summary rejection of these two bands in this first above-95 GHz license application after issuance of the *1stR&O* raises serious questions about whether the present policy is effective in carrying out the balanced, substantive and transparent process that mmWC seeks in its *Petition*.

CONCLUSIONS

The Boeing *Opposition* is based on two basic, unsubstantiated claims: 1) the proposed change would cause harmful interference to passive EESS satellites and as a result harm to critical infrastructure; and 2) the Coalition's *Petition*'s issue had already been addressed by the Commission and was "repetitive." In the foregoing submisssion, we have refuted their first claim by showing that Boeing fails to consider *any* of the specific provisions in the *Petition* that were crafted to prevent the harmful interference that they allege. Indeed, mmWC is seeking to change the rules to avoid the type of automatic "no" that Boeing promotes in its submission. Second, we have shown that the *1stR&O* is explicit in stating that the issue of the Coalition's proposed US246 had not been addressed, but rather was "beyond the scope" of that proceeding.

We urge the Commission to grant the *Petition* by issuing a timely Notice of Proposed Rulemaking to develop a full record on this issue.

Respectfully submitted,

/s/

Mark Cudak
Chair of Steering Group
mmWave Coalition

cc: Julius Knapp
Eric Burger
Jamison Prime
Michael Ha
Nicholas Oros

Audrey Allison – Boeing
Anna Gomez – Wiley Rein

Attachment 1: mmWave Coalition membership

- American Certification Body, Inc.
- Azbil North America Research and Development, Inc.
- Global Foundries, Inc.
- Keysight Technologies
- National Instruments
- Nokia Corporation
- NSI-MI Technologies
- Nuvotronics, Inc.
- NYU WIRELESS
- Qorvo, Inc.
- RaySecur
- VEGA Americas
- Virginia Diodes, Inc.

Attachment 2: mmWC Proposal for Change of Provisions Above 95 GHz

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US246 No station shall be authorized to transmit in the following bands: 73-74.6 MHz, 608-614 MHz, except for medical telemetry equipment[1] and white space devices[2], 1400-1427 MHz, 1660.5-1668.4 MHz, 2690-2700 MHz, 4990-5000 MHz, 10.68-10.7 GHz, 15.35-15.4 GHz, 23.6-24 GHz, 31.3-31.8 GHz, 50.2-50.4 GHz, 52.6-54.25 GHz, 86-92 GHz,

In the following bands all unlicensed devices and all mobile stations are forbidden and FCC and NTIA will only issue licenses or assignments under mutually agreed procedures that assure that authorized Radio Astronomy Service facilities and Earth Exploration Satellite Service stations are protected from both the individual and aggregate emissions to the criteria given in ITU-R RS.2017, ITU-R RS.1858, ITU-R RA.517, ITU-R RA.517, ITU-R RA.611, ITU-R RA.769-2 and ITU-R RA.1031.: 100-102 GHz, 109.5-111.8 GHz, 114.25-116 GHz, 148.5-151.5 GHz, 164-167 GHz, 182-185 GHz, 190-191.8 GHz, 200-209 GHz, 226-231.5 GHz, 250-252 GHz.

In cases where there is a formal coordinated FCC/NTIA/DOS US proposal to ITU-R to adopt a stricter standard protection limit, that draft position will apply as long as the draft is pending in ITU-R.

[1] Medical telemetry equipment shall not cause harmful interference to radio astronomy operations in the band 608-614 MHz and shall be coordinated under the requirements found in 47 CFR 95.1119.

[2] White space devices shall not cause harmful interference to radio astronomy operations in the band 608-614 MHz and shall not operate within the areas described in 47 CFR 15.712(h).

Attachment III: Experimental License Issued to Brown University Denying Access to 2 Requested Bands

Timothy Wells, P.O. Box 1885, Providence, RI 02912-1885,

United States of America
FEDERAL COMMUNICATIONS COMMISSION
EXPERIMENTAL
RADIO STATION CONSTRUCTION PERMIT
AND LICENSE

EXPERIMENTAL	WI2XVS
(Nature of Service)	(Call Sign)
XT MO	0131-EX-CM-2019
(Class of Station)	(File Number)

NAME Brown University

Subject to the provisions of the Communications Act of 1934, subsequent acts, and treaties, and all regulations heretofore or hereafter made by this Commission, and further subject to the conditions and requirements set forth in this license, the licensee hereof is hereby authorized to use and operate the radio transmitting facilities hereinafter described for radio communications in accordance with the program of experimentation described by the licensee in its application for license.

Operation: In accordance with Sec. 5.3(H) of the Commission's Rules

Station Locations

(1) MOBILE: Brown University Campus, Providence, RI, within 1.5 km, centered around NL 41-49-35; WL 71-23-50

Frequency Information

MOBILE: Brown University Campus, Providence, RI, within 1.5 km, centered around NL 41-49-35; WL 71-23-50

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
195-200 GHz	MO	2G00K1D	12.6 W (ERP)	0.00001 %
292-308 GHz	MO	2G00K1D	2.8 W (ERP)	0.00001 %
390-410 GHz	MO	2G00K1D	4 W (ERP)	0.00001 %

Special Conditions:

(1) Licensee should be aware that other stations may be licensed on these frequencies and if any interference occurs, the licensee of this authorization will be subject to immediate shut down.

This authorization effective August 20, 2019 and
will expire 3:00 A.M. EST July 01, 2021

FEDERAL COMMUNICATIONS COMMISSION

Special Conditions:

(2) In lieu of frequency tolerance, the occupied bandwidth of the emission shall not extend beyond the band limits set forth above.

(3) The designated point of contact to terminate the systems if interference occurs is Dr. Mittleman at 713-992-4137.

(4) NASA and NTIA objected to operate the frequency band 97.5-103 GHz and 200-205 GHz.